



NOAA
FISHERIES

Northwest
Fisheries
Science
Center

7.0 Salmon Harvest and Protected Species

Robert Kope

May 5, 2015

Harvest overview

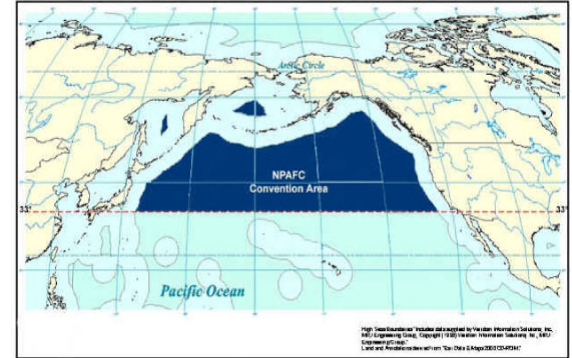
- Because of anadromy and migratory behavior, Pacific salmon fisheries are subject to multiple layers of management ranging from the high seas to local watersheds
- International conventions and treaties
- Federal regulation of ocean fisheries in the EEZ
- State and local regulation of fisheries in coastal marine waters and freshwater
- ESA listed stocks are intermingled with non-listed stocks and subject to harvest in mixed-stock fisheries

Management of salmon fisheries

- NPAFC – US, Canada, Russia, Japan, Korea
 - High seas outside of EEZ, north of 33 degrees N latitude
- PSC – US, Canada
 - Marine waters and transboundary rivers from Yukon to central OR
- PFMC – US, CA, OR, WA, ID, treaty tribes, harvest sector, NGOs
 - EEZ off CA, OR, and WA outside of 3 nautical miles
- States
 - Waters inside of 3 nautical miles, freshwater
- Federally recognized tribes
 - All fisheries on reservations
 - Tribal fisheries at usual and accustomed fishing locations
- Science centers are involved with fisheries under federal and international jurisdiction, and fishery impacts on listed stocks

International Commissions

- NPAFC
 - International Convention for the Conservation of Anadromous Stocks in the North Pacific Ocean
 - Focus: study of the distribution and ecology of anadromous salmonids in the North Pacific Ocean; restriction of fishing to scientific study only within the Convention Area.
- PSC
 - Pacific Salmon Treaty
 - Focus: Conservation and allocation of harvest between the US and Canada
- Neither directly regulates fisheries, but advises member nations on regulation



Pacific Fishery Management Council (PFMC)

- Authorized by the Magnuson–Stevens Act
- Manages fisheries (with NMFS approval) for Pacific salmon, groundfish, highly migratory species, and coastal pelagic species, under fishery management plans
- Pacific Salmon FMP
 - Includes 45 Chinook, 21 coho, and 1 pink salmon “stocks”
 - Most stocks have conservation objectives
 - MSY, hatchery production, ESA
 - Stock complexes with indicator stocks
 - Goal is to maximize harvest opportunity subject to meeting (in expectation) all conservation objectives and other constraints (ESA, PST)
 - MSA requirements:
 - Status determination criteria : overfishing, overfished, approaching overfished
 - Rebuilding plans for overfished stocks
 - Annual catch limits
 - Accountability measures

Science Centers' role in salmon fisheries mgt

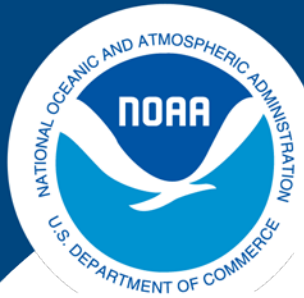
- Scientific and technical review and advice
 - PSC - Chinook, Coho, Chum Technical Committees
 - PFMC – Salmon Technical Team, Scientific and Statistical Committee
- Development of management plans and conservation objectives
- Analysis of management strategies and measures
- Assessment of stock status and fishery impacts

Harvest and protected species

- ESA allows incidental take of listed species
- Jurisdiction is NMFS only (not PFMC, states, tribes, etc.)
- NMFS Regional Office conducts consultations resulting in Biological Opinions for each listed ESU
 - If no jeopardy
 - Incidental take statements
 - 4(d) determination
 - If jeopardy
 - Reasonable prudent alternative (RPA)
 - All authorized incidental take has specific limits which, if exceeded, trigger re-initiation of consultation
 - Collectively referred to as “consultation standards”
- In addition to meeting all conservation objectives, fisheries must also meet all consultation standards
 - Consultation standards are largely responsible for the extent and configuration of current salmon fisheries in the contiguous US

Science Centers' role

- Assist and consult with Regional Office in evaluating impacts of harvest on listed stocks:
 - Status reviews
 - Recovery planning
 - Biological Opinions
 - Reasonable prudent alternatives
 - Assessment of compliance with consultation standards
 - Impacts on other listed species



NOAA
FISHERIES

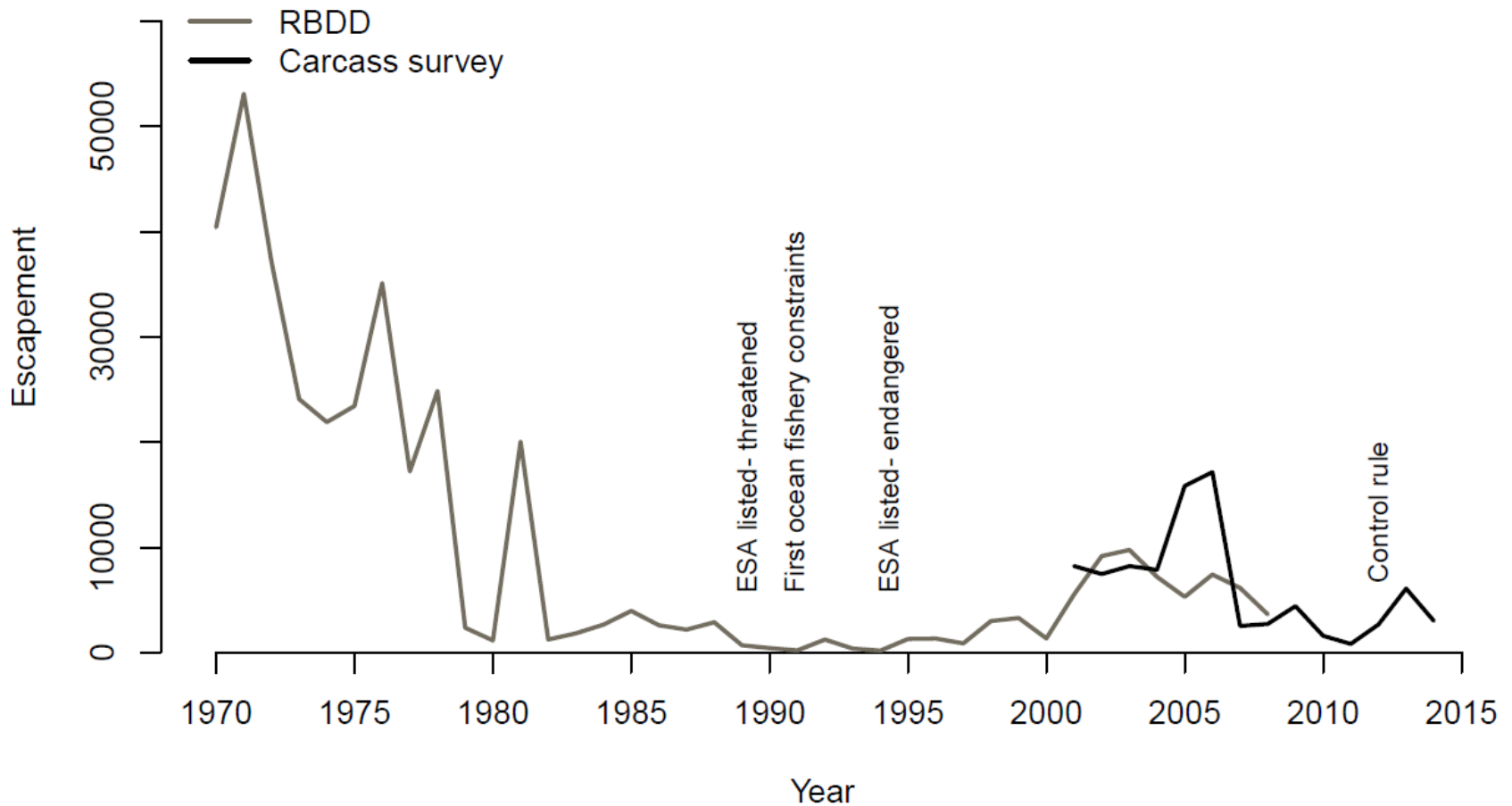
Southwest
Fisheries
Science
Center

Sacramento River winter Chinook management strategy evaluation

Michael O'Farrell

May 5, 2015

Sacramento River winter Chinook



Winter Chinook fishery consultation

- 2010 ocean salmon fishery Biological Opinion (BiOp): Jeopardy
- Reasonable and Prudent Alternative (RPA)
 - Thresholds related to status must be established
 - Fishery mgt objectives must be established
 - Assessment models must be developed

Science supporting the BiOp and RPA

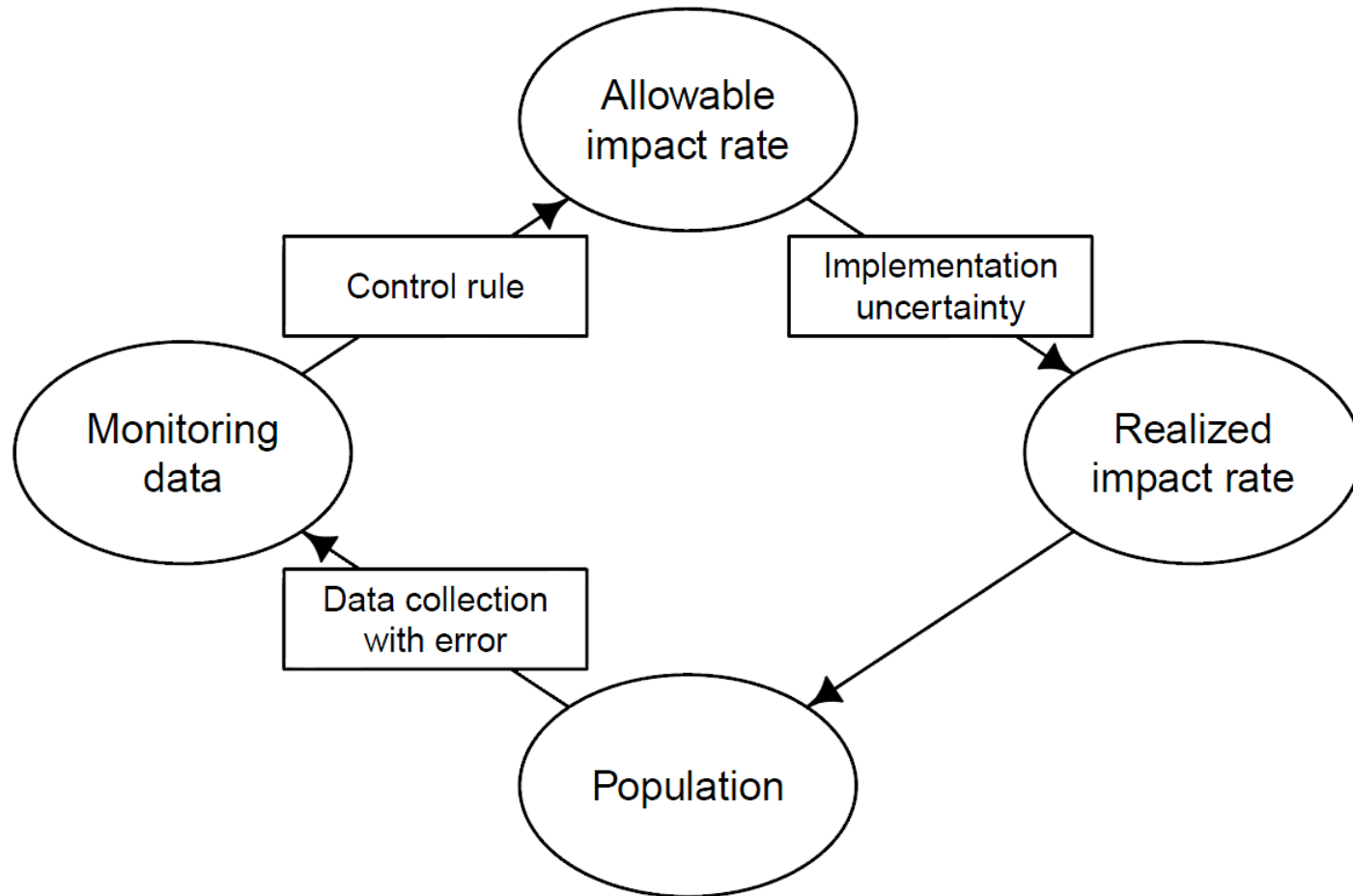
- Assessment
 - Harvest model:
 - O'Farrell et al. 2012a. NOAA Tech Memo 489
 - Cohort reconstruction model:
 - O'Farrell et al. 2012b. NOAA Tech Memo 491
- Fishery mgt objectives
 - Management Strategy Evaluation:
 - Winship et al. 2012 Report provided to SW Region and PFMC
 - Winship et al. 2013. Biol. Cons. 158
 - Winship et al. 2014. Trans. Am. Fish. Soc. 143

Extinction Risk (Lindley et al. 2007)

Criterion	Risk of Extinction		
	High	Moderate	Low
Extinction risk from PVA	> 20% within 20 years – or any ONE of –	> 5% within 100 years – or any ONE of –	< 5% within 100 years – or ALL of –
Population size ^a	$N_e \leq 50$ –or– $N \leq 250$	$50 < N_e \leq 500$ –or– $250 < N \leq 2500$	$N_e > 500$ –or– $N > 2500$
Population decline	Precipitous decline ^b	Chronic decline or depression ^c	No decline apparent or probable
Catastrophe, rate and effect ^d	Order of magnitude decline within one generation	Smaller but significant decline ^e	not apparent
Hatchery influence ^f	High	Moderate	Low



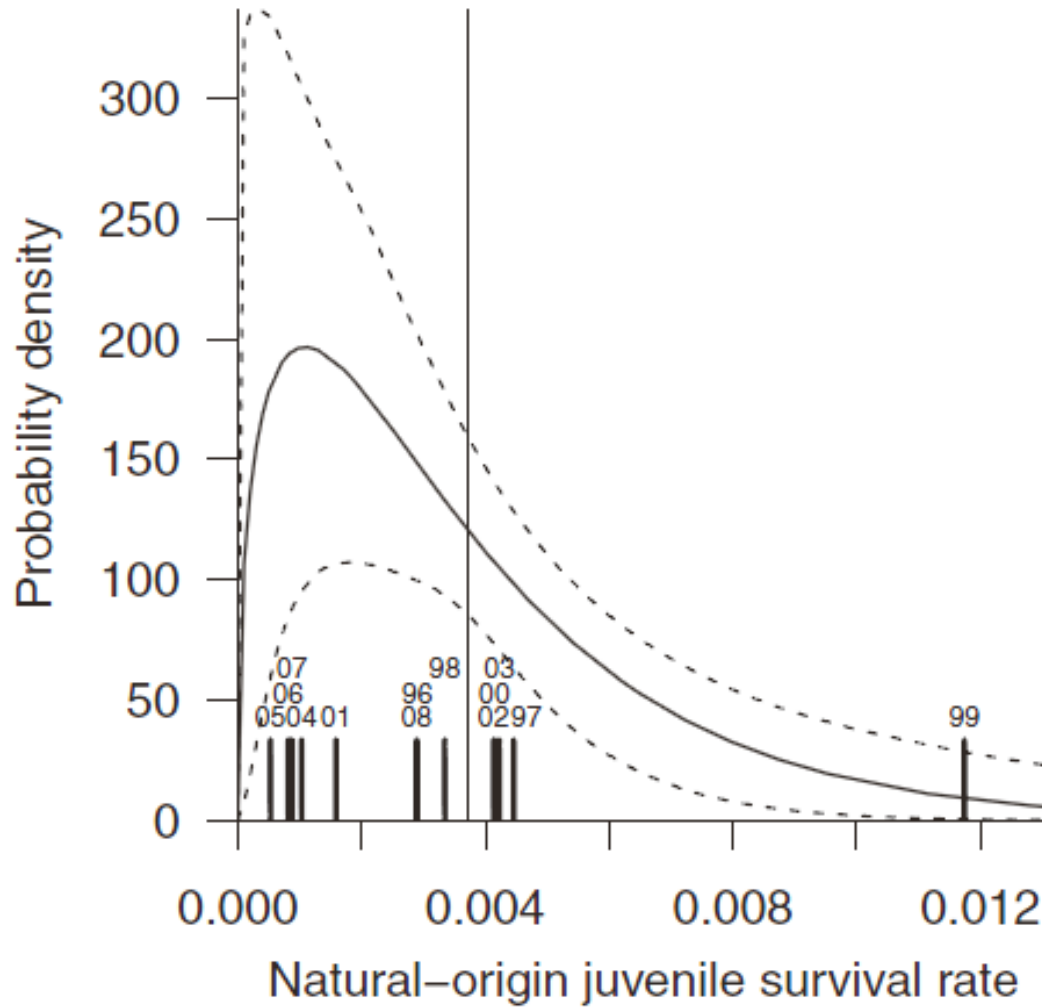
Management Strategy Evaluation (MSE)



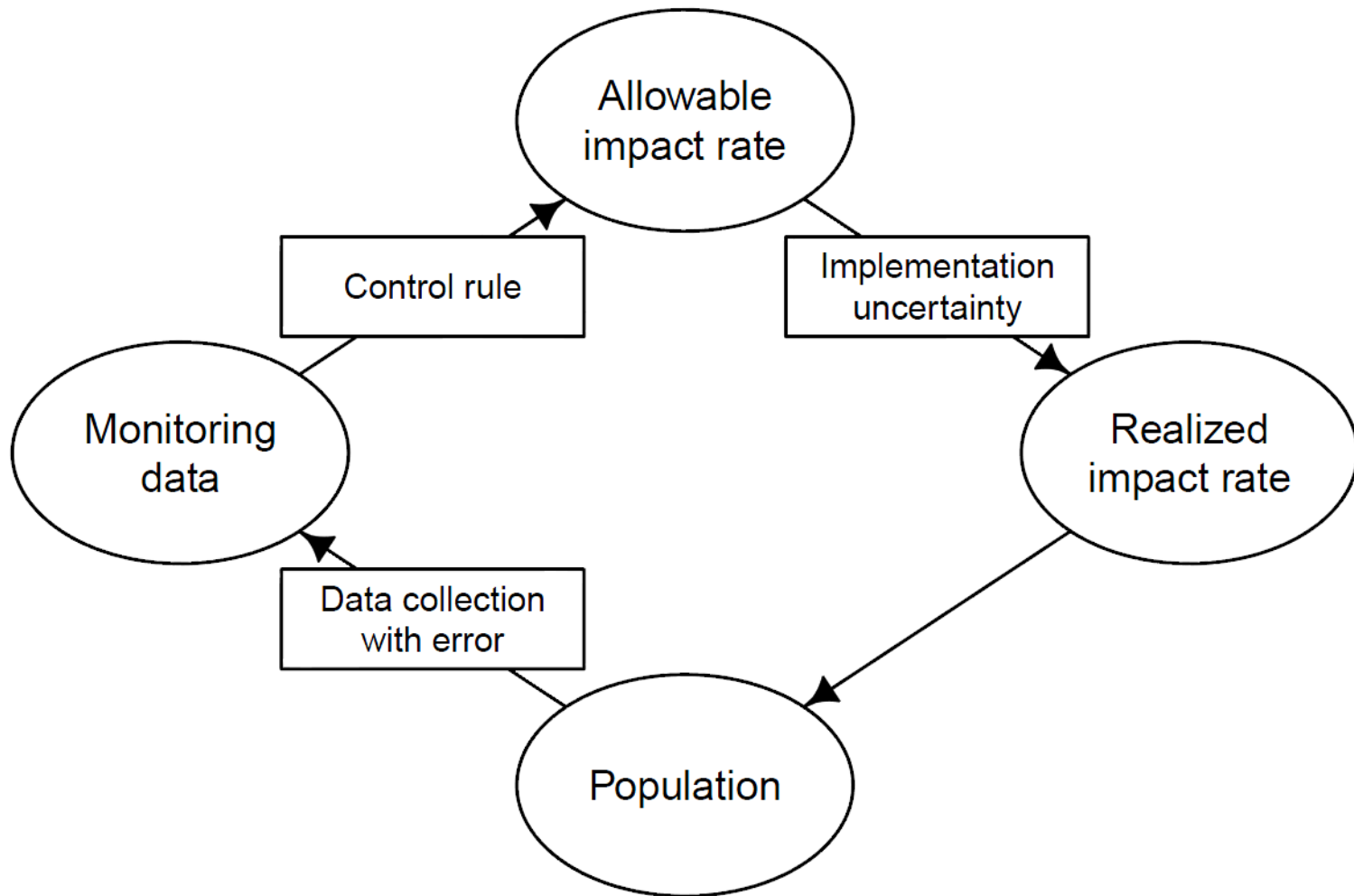
Population dynamics model

- Stochastic
- Structured by age, sex, origin
- Annual time step
- Parameterization: statistical model (Winship et al. 2014)
- Beverton-Holt spawner to fry relationship
- Density-independent juvenile survival
- Fishing mortality (O'Farrell et al. 2012b)
- Adult natural mortality
- Maturity

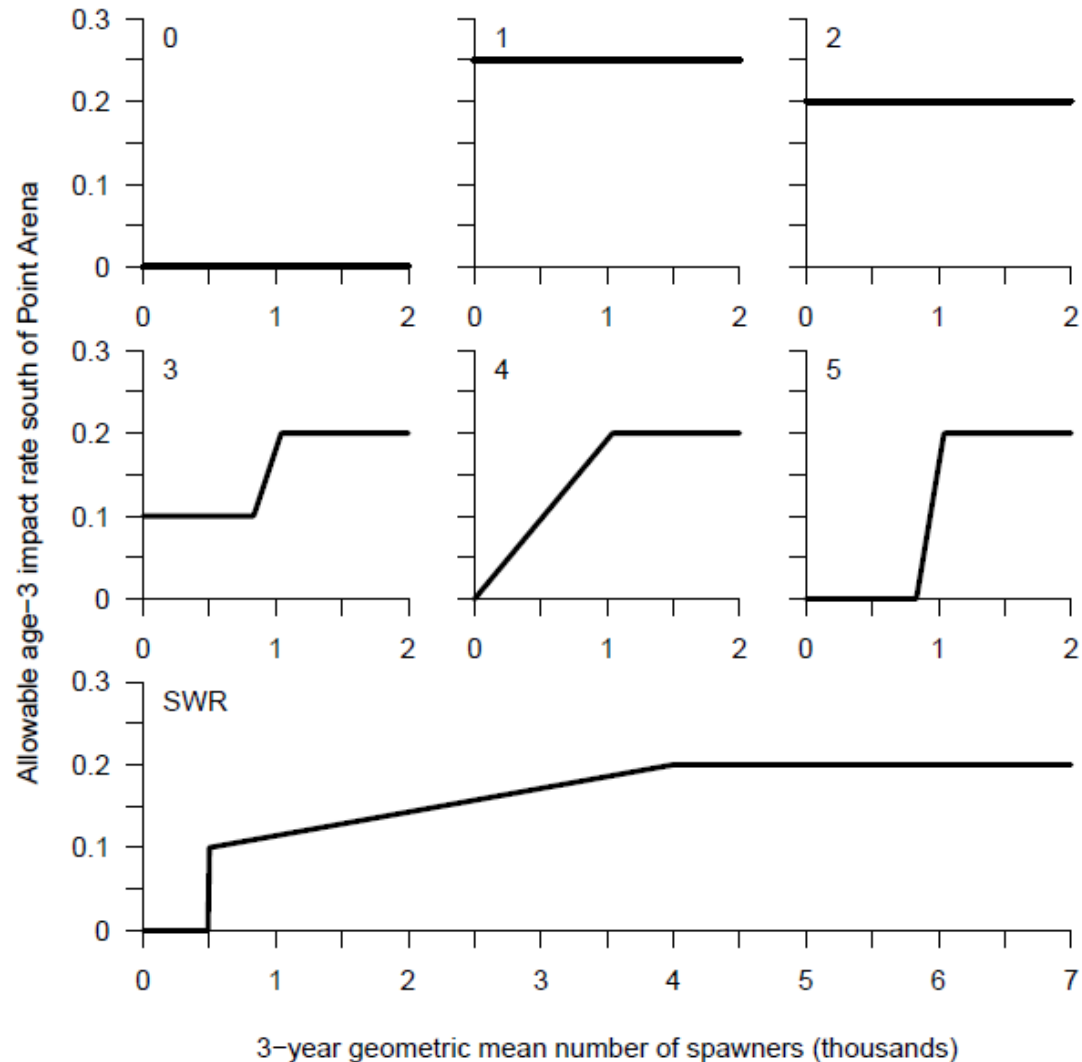
Juvenile survival rate

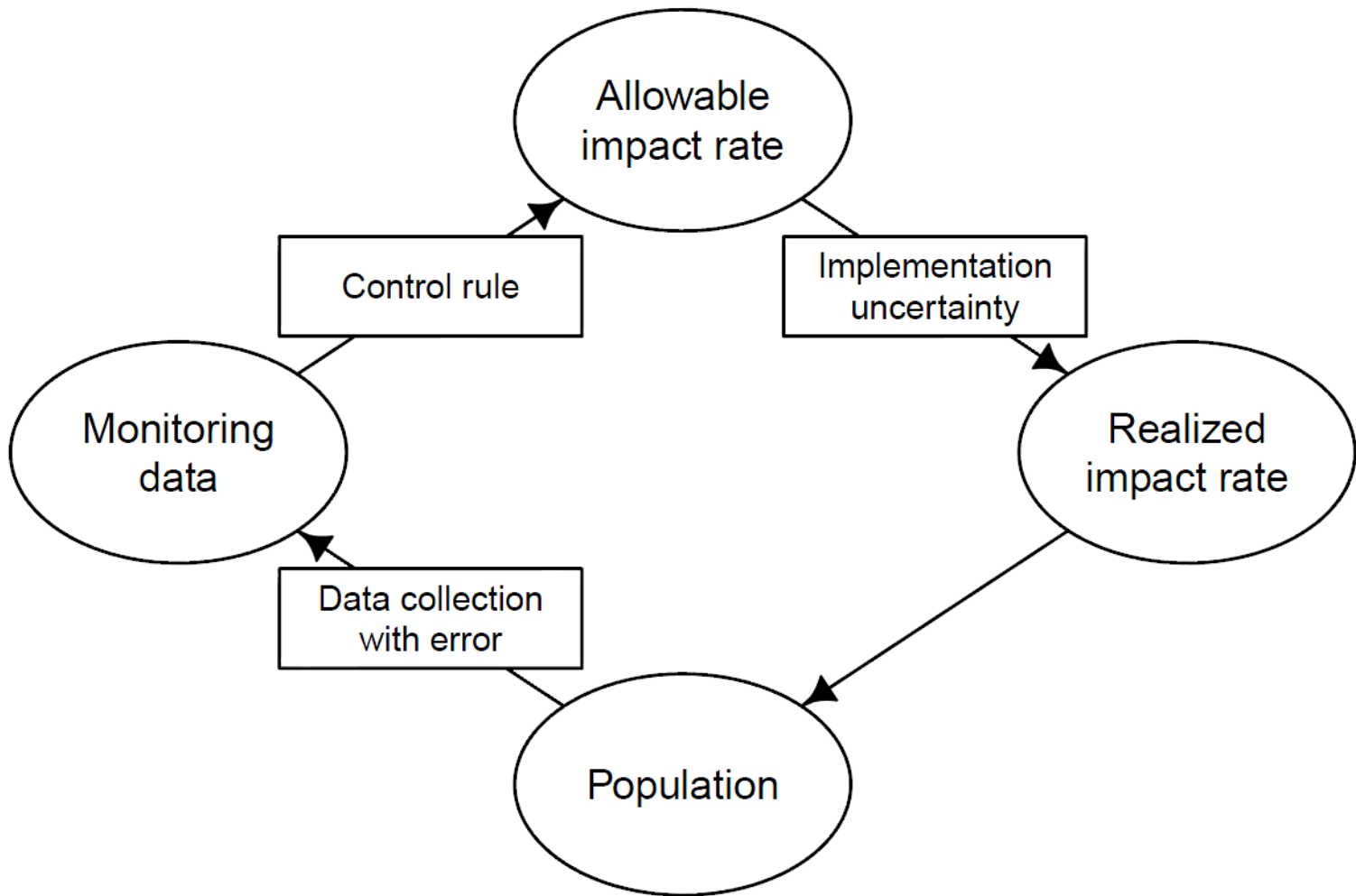


Winship et al. 2014

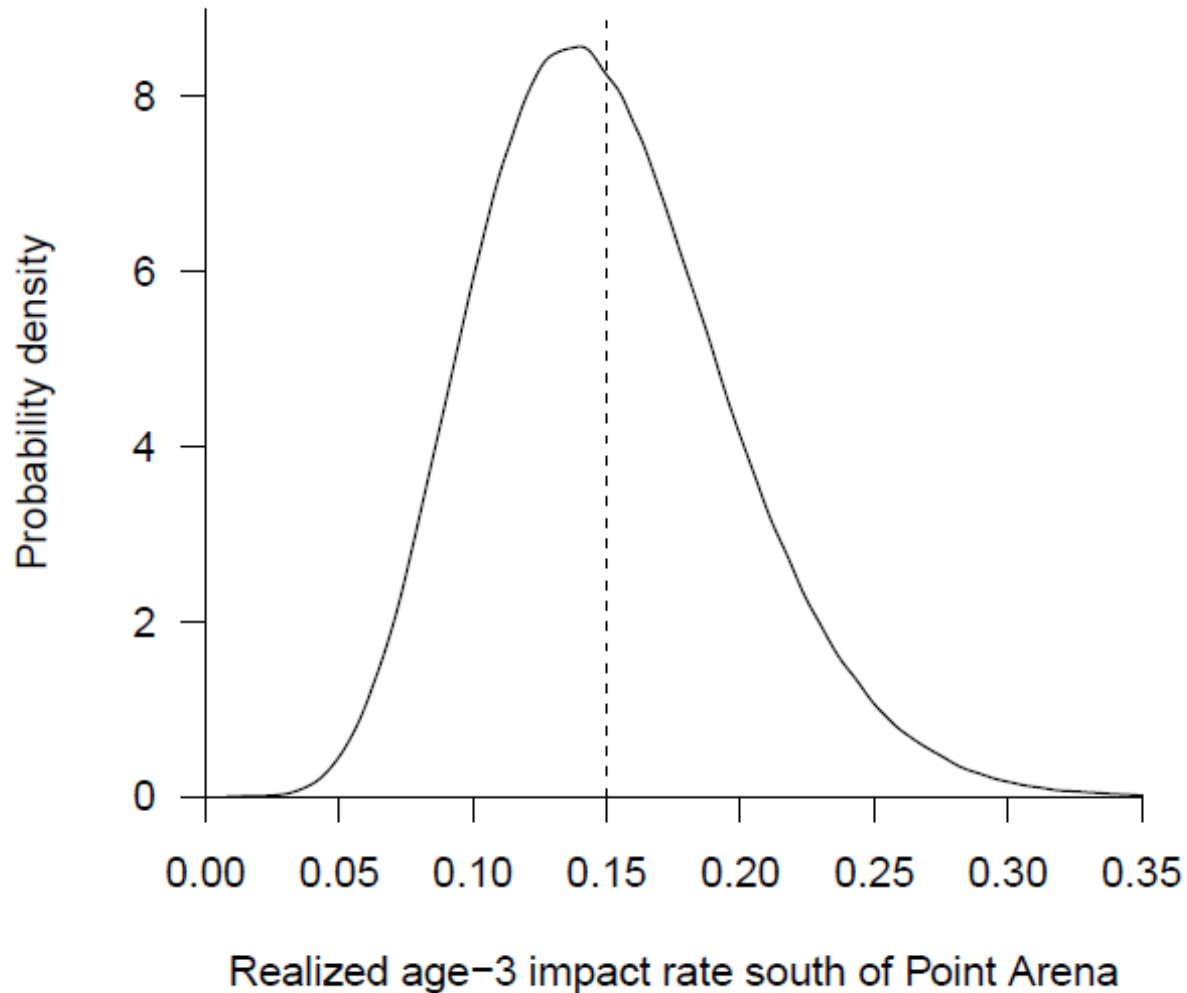


Control rules





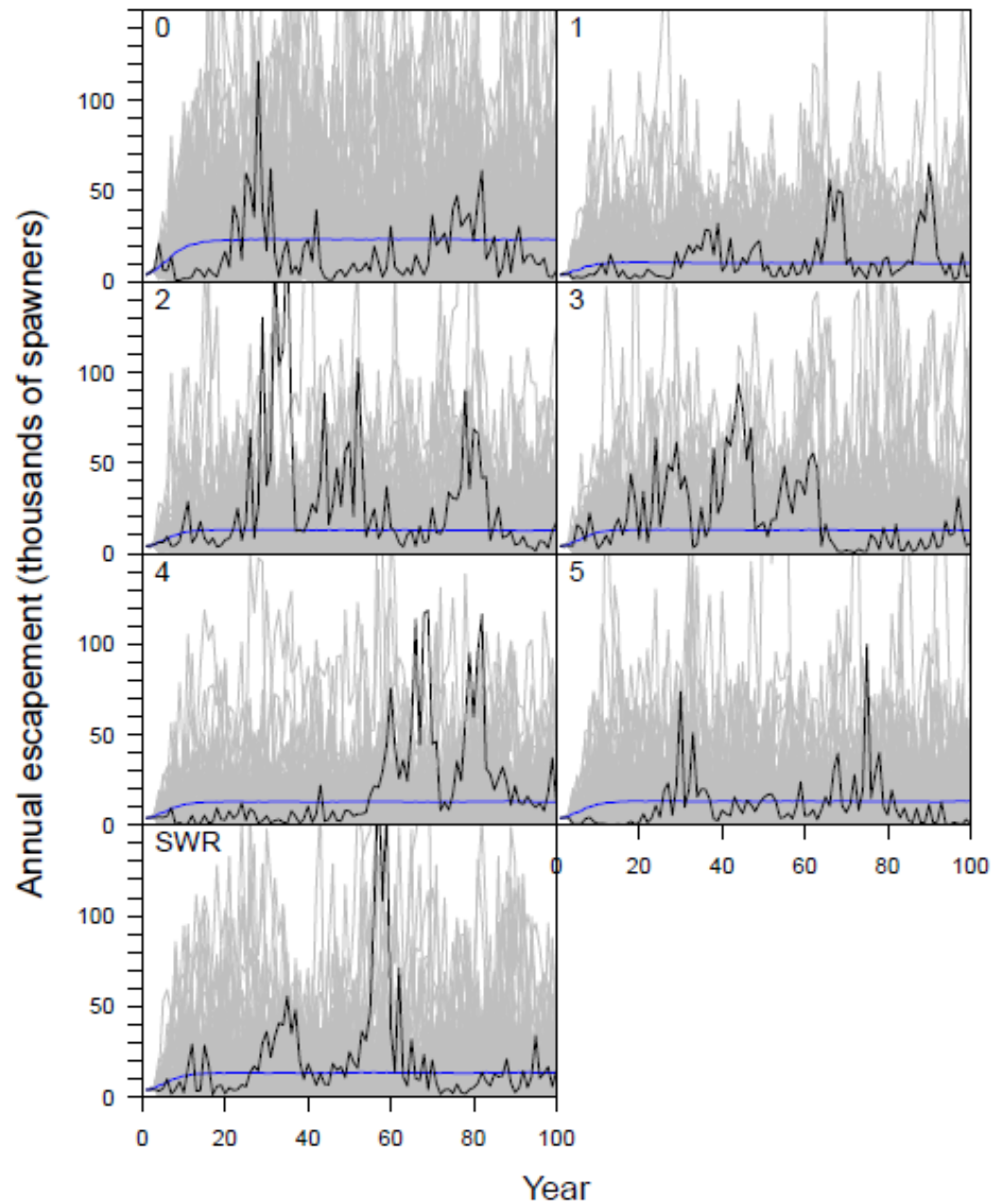
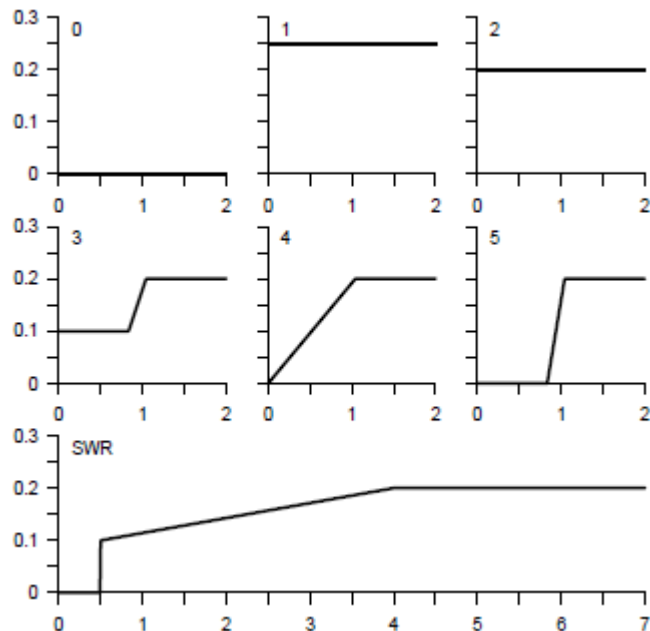
Fishery impact rates



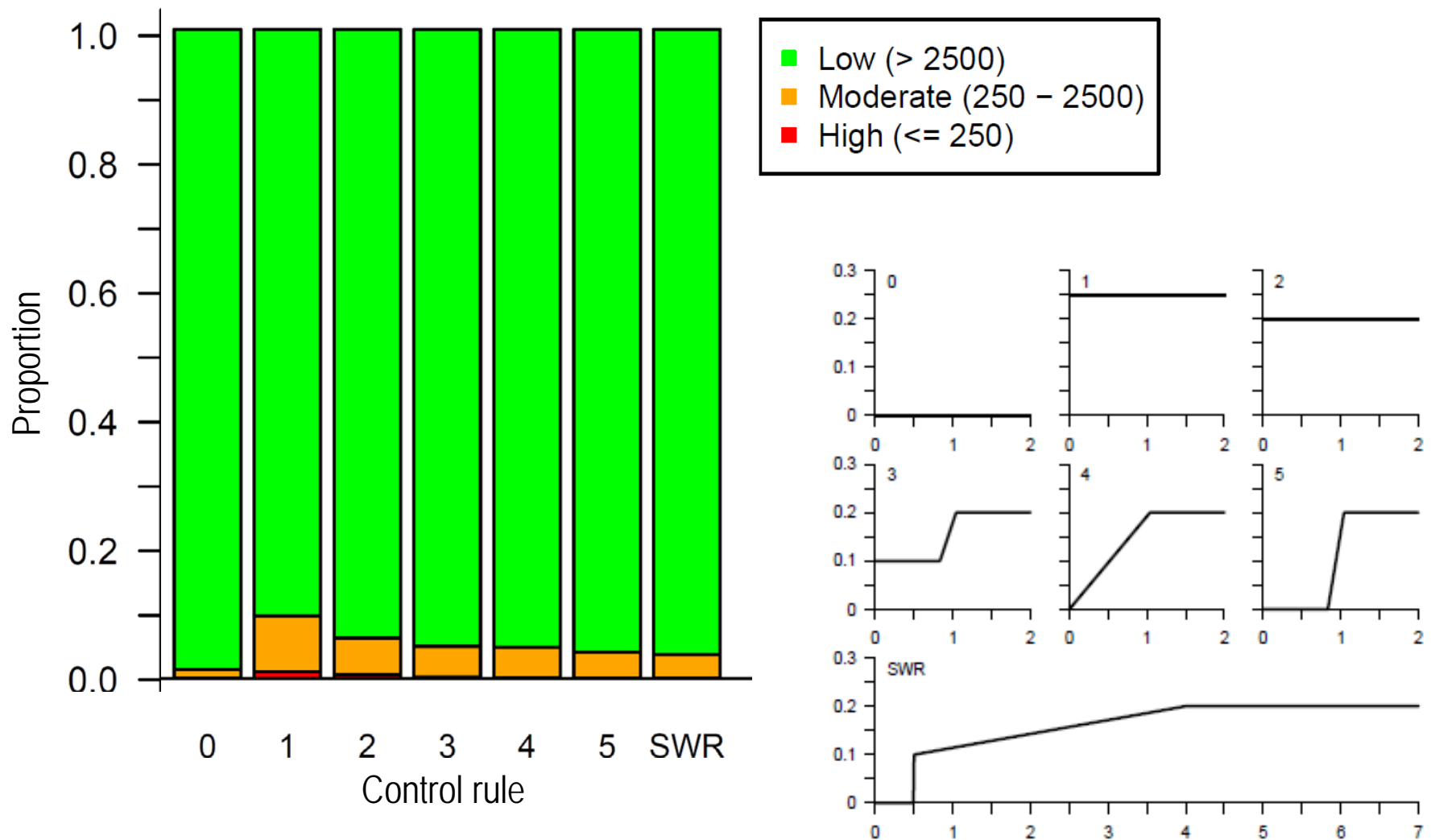
MSE: general procedure

- 100 year simulations
- Alternative scenarios
 - Number of escapement years used for control rules
 - Autocorrelated early life survival
- 20,000 simulations for each control rule and scenario
- Evaluate extinction risk (Lindley et al. 2007)
- Evaluate fishery effects

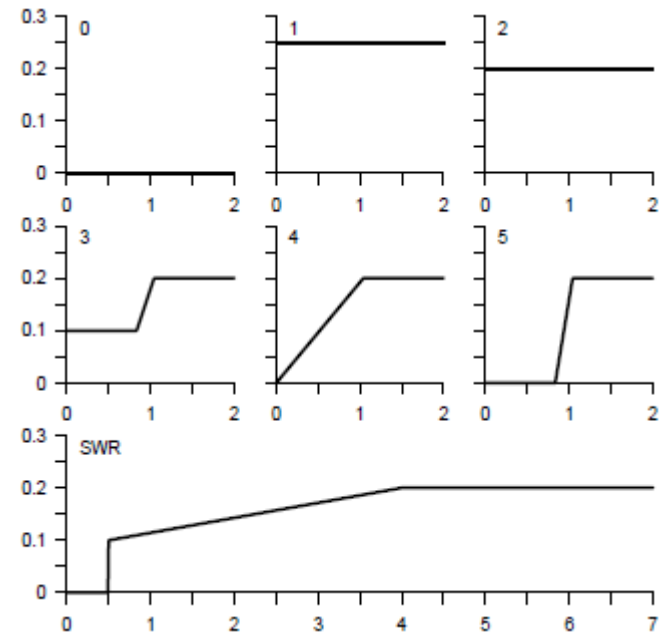
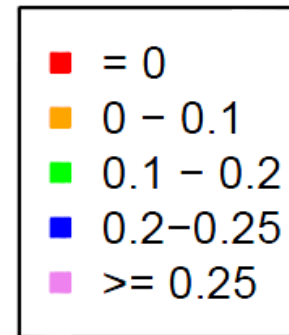
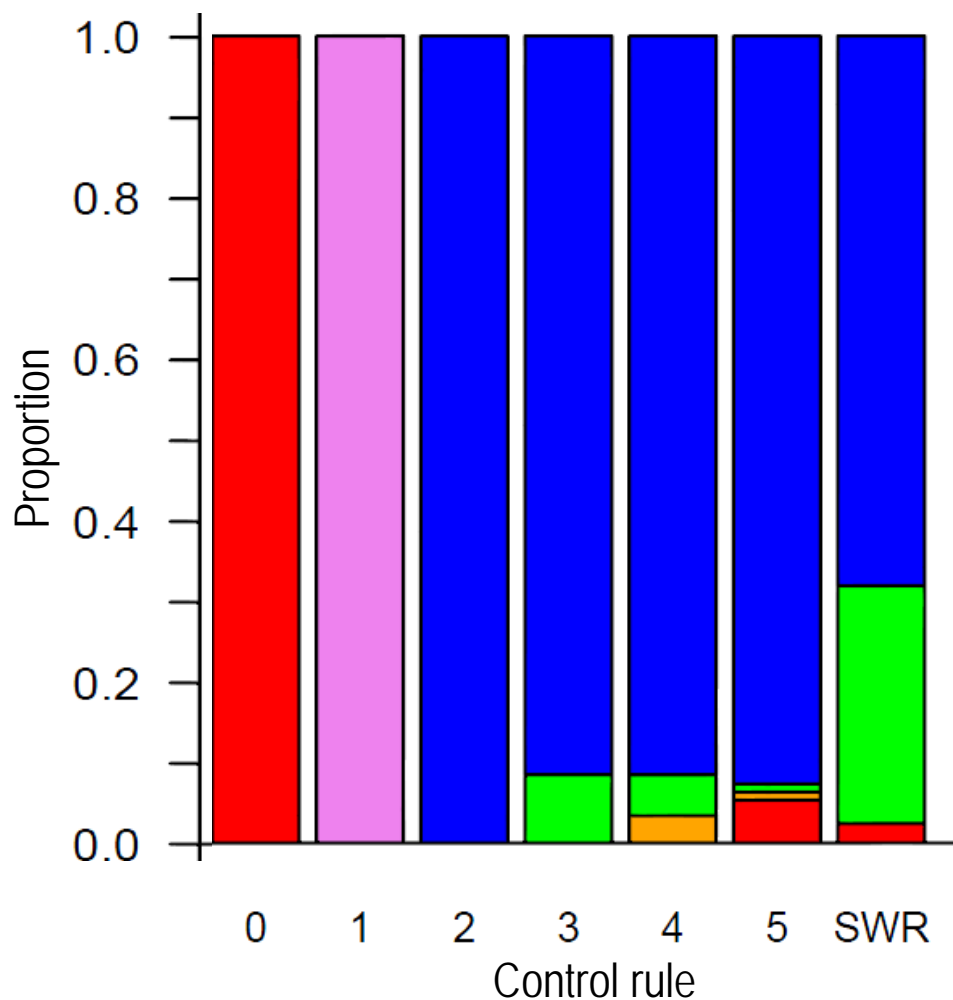
Escapement



Extinction risk: population size criterion



Fishery effects: allowable impact rates



Summary

- A series of investigations was initiated in support of the 2010 BiOp and RPA implementation
- MSE was used to evaluate candidate management approaches in terms of extinction risk and effect on salmon fisheries
- The MSE modeled the biological and management systems, and their uncertainty
- This science was provided to the Regional Office to aid in their choice of a control rule

Summary, contd.

- Data used to parameterize the MSE were collected by partner agencies (e.g., USFWS, CDFW) and are publically available
- All work described here has been presented to partners (e.g., PFMC, CDFW), peer reviewed, and published

Concluding remarks

Strengths

- Science Centers (SCs) provide scientific support to harvest mgt and have a deep understanding of the issues
- Generally good history of collaboration between the SCs and other (e.g., state) partners

Challenges

- Near lack of data for some listed stocks (e.g., CA coastal Chinook)
- Increased demand for more highly stratified assessments despite limited data
- Diminishing data richness as fisheries have become more restricted
- Collaboration with state partners becoming more difficult with diminishing budgets

Opportunities

- Genetic methods can provide data on unmarked, natural-origin stocks (which presents nontrivial assessment challenges)